

Low-Noise, UV-to-SWIR Broadband Photodiodes for Large-Format Focal Plane Array Sensors, Phase I

Completed Technology Project (2010 - 2010)

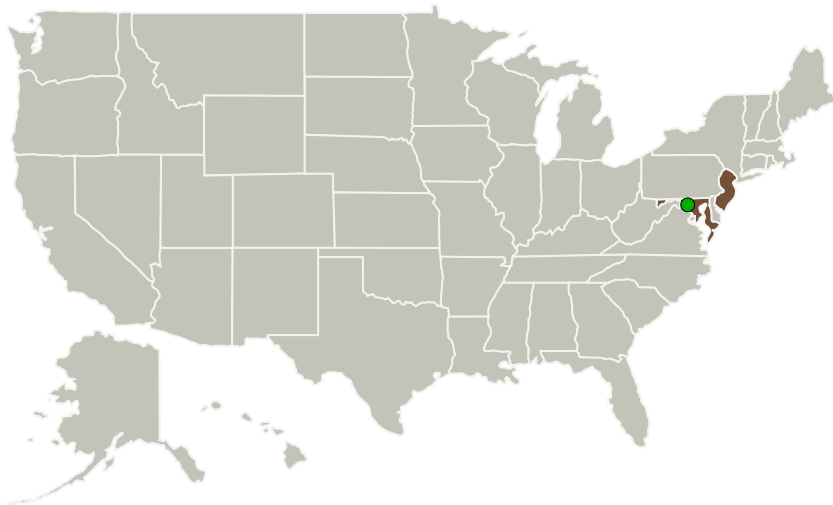


Project Introduction

Broadband focal plane arrays, operating in UV-to-SWIR wavelength range, are required for atmospheric monitoring of greenhouse gases. Currently, separate image sensors are used for different spectral sub-bands: GaN for UV, Si for visible, and InGaAs for SWIR, requiring expensive component-level integration for hyper-spectral imaging. Also, the size of the InGaAs focal plane arrays is currently limited by the InP substrate area. We propose a GaAs/InGaP/InGaAs based photodiode on standard GaAs substrates for large-format (4096 x 4096) focal plane arrays with the following characteristics: (1) Wavelength = 0.25 to 2.5 micron; (2) Quantum Efficiency > 30% in UV (0.25 to 0.4 micron), > 80% in Visible (0.4 to 0.9 micron), and > 70% in IR (0.9 to 2.5 micron) subbands; (3) Photodiode Area (single element) = 15 x 15, 25 x 25, and 50 x 50 micron square; (4) RoA > 35 Ohm-cm² at 300K; and (5) Bandwidth > 1 GHz.

Additionally, feasibility of UV-to-SWIR graded optical filters will be investigated. Based on P.I.'s experience on SCIAMACHY, this project will enable one image sensor for 8 spectroscopic channels currently orbiting on European Space Agency's ENVISAT. Also, feasibility of large-format image sensors on GaAs substrates will be demonstrated.

Primary U.S. Work Locations and Key Partners



Low-Noise, UV-to-SWIR
Broadband Photodiodes for
Large-Format Focal Plane Array
Sensors, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

Low-Noise, UV-to-SWIR Broadband Photodiodes for Large-Format Focal Plane Array Sensors, Phase I


Completed Technology Project (2010 - 2010)




Organizations Performing Work	Role	Type	Location
Discovery Semiconductors, Inc.	Lead Organization	Industry Minority-Owned Business	Ewing, New Jersey
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	New Jersey

Project Transitions

 **January 2010:** Project Start

 **July 2010:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139999>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Discovery Semiconductors, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Abhay M Joshi

Co-Investigator:

Abhay Joshi

Low-Noise, UV-to-SWIR Broadband Photodiodes for Large-Format Focal Plane Array Sensors, Phase I

Completed Technology Project (2010 - 2010)



Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System